

SUBJECT:	Fermilab Assessment Manual – Chapter 4 Independent QA Assessment Procedure – Form 2	NUMBER:	3902.1004 FORM 2
RESPONSIBILITY:	Quality Assurance Manager	REVISION:	001.4
APPROVED BY:	Head, Office of Quality and Best Practices	EFFECTIVE:	11/15/2011

Fermilab Independent QA Assessment Report	
Assessment Number & Title: 12-QA-018 FESS-Design/Engineering	Version: 001
Date(s) of Assessment: 08/27/12 – 08/30/12	
Performing Organization: Office of Quality & Best Practices	
Assessed Organization(s): Facilities Engineering Services Section (FESS) Engineering Department According to the FESS Engineering homepage and persons interviewed: Acting as an in-house Architectural/Engineering (A/E) firm, the Engineering Department of FESS provides expertise for conventional facility design and construction activities and directs outside A/E services. As part of this service, they work with customer division/sections to develop Project Definition and Conceptual Design Reports. They also produce construction documents, support procurement functions, and provide quality assurance and safety oversight during construction.	
Assessment Activities & Scope: Implementation and effectiveness of design and engineering as described in IQA Chapter 6 and Fermilab Engineering Manual were examined via interview, observation, and document review. Scope Limitations: Procurement activities and software are excluded from this assessment. Activities Reviewed Within this Assessment: <ul style="list-style-type: none"> • Project Management • Civil Engineering • Electrical Engineering • Architectural Design 	
Description of the Implementation & Effectiveness of Observed Activities: <u>Design & Engineering</u> The requirements of IQA Chapter 6, Design, are met and are effectively implemented within FESS. The assessment concentrated on Project Management since it is responsible for ensuring that the Architectural and Engineering Firm's (A&E) design meets the project plan, for performing the risk assessment using the graded approach, and for ensuring that all engineering is performed according to the provisions of the Engineering Manual. Engineers are responsible for following the provisions of the Engineering Manual and for fulfilling additional FESS requirements. Three FESS projects were evaluated: <ul style="list-style-type: none"> • Liquid Argon Test Facility (LArTF) • Master Substation Bypass (MSS) • Illinois Accelerator Research Center (IARC), Office, Technical, and Education Building (OTE) 	

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Discussion with the Project Managers and evaluation of documentation (File01 – File03) confirmed that all three projects developed Engineering Design Project Plans and performed risk assessments as specified in the Fermilab Engineering Manual, Chapters 1 & 2. Fermilab Risk Assessment Spreadsheet was used to perform the risk assessment. The Project Plans were also written in accordance with FESS Standard Operating Procedure, 4.1.0.1, Project Plan Preparation. A&E firms were contracted to develop civil construction specifications for each project.

<u>A&E Firm</u>	<u>Project</u>
Crawford, Murphy & Tilly, Inc.	LArTF
Laramore, Douglass, and Popham	MSS
Ross Barney Architects	IARC,OTE – Design Architect
HOK, Inc.	IARC,OTE – Architect of Record

The IARC project was determined to be high risk with project risk elements K, regulatory requirements and O, project cost assessed as high. This project is being funded by the state of Illinois which requires additional controls that are addressed by Department of Commerce and Economic Opportunity, Project Status Report and Financial Status Report, File04 and File05 respectively.

Interviews with Engineers and Architects and evaluation of project plans confirmed that conceptual design reviews and final design reviews were being performed. The design reviews were documented as required by Chapters 3 and 5 of the Fermilab Engineering Manual. The design reviews were also performed in accordance with FESS Standard Operating Procedure, 8.3.5.1, Document Reviews.

The review of the civil construction specifications (File06 – File10) confirmed that the Construction Specifications Institute's Master Specification Format was used, and the specifications included the subject items identified in Chapter six of the Engineering Manual.

The three projects followed FESS document numbering scheme indicated in the CAD Standard Manual and as referred to in Chapter 4 of the Engineering Manual. Drawings as well as engineering calculations were deliverables produced by the contracted A&E firm. Direct observation of the project drawings confirmed that drawings are reviewed by a qualified person other than the drawings' originator, and changes are tracked on each version of the drawings. Engineering drawings reviewed in Appendix 1 meet the requirements of the Engineering Manual, Chapter 4.

Calculations performed by the A&E firms were peer reviewed (within the A&E firm) and have sufficient detail so they are reproducible. This was verified reviewing Cable Pulling Tension and Conduit Fill Calculations (File11), Manhole Extension Structural Calculations (File12), and Electrical Load Calculations (File13). Engineering calculation requirements of the Engineering Manual, Chapter 4, are effectively implemented.

The civil construction specifications identified what tests are to be performed during construction. Review of the in-place (soil) density tests performed for LArTF (File14) show that the test and validation requirements of the Engineering Manual, Chapter 7, are effectively implemented. The MSS Bypass project has yet to start, and no tests were done on the IARC project at the time of this assessment, so there is no test documentation available for these projects.

Conversation with the Project Managers identified that it was far too early in the project schedule to

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review Release to Operations and Final Documentation requirements for the three projects, as specified in Chapters 8 and 9 of the Engineering Manual.

All three projects established an engineering baseline, and the baseline addresses project requirements, plan, cost and implementation. Changes are controlled through a change control board as identified in the respective project plan. The design control requirements of IQA chapter 6 are effectively implemented.

Conclusions:

Design controls identified in IQA chapter 6 and the engineering requirements of the Fermilab Engineering Manual through chapter 7 are being followed. Review of project plans, construction specifications, risk assessments, drawings and reports show compliance with the requirements. Furthermore, individuals interviewed have strong construction/engineering knowledge and understand the requirements of the Fermilab Engineering Manual.

Findings:

1. None

Observations and Recommendations:

1. **Observation:** FESS Standard Operating Procedure, 4.1.0.1, Project Plan Preparation states:
 - The Project Charter (PC) incorporates the signed U.S. Department of Energy Construction Authorization as part of this document. The DOE Construction Authorizations were obtained, but were not included in the Project Plan.
 - The Project Plan template is located on the FESS/Engineering file server in a folder titled “Public”. There is confusion because the template is not available to the public.
 - Conceptual Design Review, Section 3.2 indicates that the Conceptual Design Review comments (3.2.4) and the Stakeholder comments (3.2.11) are located in different sections of Appendix B. Both the Conceptual Design Review comments and Stakeholder comments were combined together at the end of Appendix B.

Recommendation: Review the Project Plan Preparation procedure and update as necessary to reflect how the project plan is put together.

2. **Observation:** FESS Standard Operating Procedure, 8.3.5.1, Document Reviews:
 - In Section II, Responsibilities, The FESS/E Project Engineer was identified as Project Coordinator in the interviews.
 - Section 2.2, states the distribution cover sheet is in pdf format. The distribution cover sheet is currently an e-mail.

Recommendation: Review the Document Reviews procedure and update as necessary to reflect current processes.

Commendable Practices:

1. None

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Persons Interviewed:

- Chuck Federowicz
- Jonathan Hunt
- Randy Wielgos
- Rhonda Merchut

Documents Reviewed:

- Fermilab Engineering Manual, Version No. 7/10
- Fermilab Risk Assessment Spreadsheet (12/9/2010)
- FESS Standard Operating Procedure, 8.3.5.1, Document Reviews, Rev. 1
- FESS Standard Operating Procedure, 4.1.0.1, Project Plan Preparation, Rev. 0

Attachments:

- File01, LArTF Project Plan.pdf
- File02, Master Substation Bypass Project Plan.pdf
- File03, IARC-OTE Project Plan.pdf
- File04, 2012 6-30 10-203829 Project Status Rpt form.xlsx
- File05, 2011 03-30 10-203828 Financial Status Rpt form as of 02.28.11.xlsx
- File06, LArTF Complete Specs_111711.pdf
- File07, MSS 3-7-83 Specs IFB.pdf
- File08 Specification Manual Volume I conformed 2012 04-16 x.pdf
- File09, Specification Manual Volume II conformed 2012 04-16.pdf
- File10, Specification Manual Volume III conformed 2012 04-16 x.pdf
- File11, MSSBP Design Calculations-Pulling Tension.pdf
- File12, MSS Manhole Extnsn Strct Calcs.pdf
- File13, Load Calculation IARC.pdf
- File14, 86-Density Test.pdf

Standards, Regulations, and Other Program Requirements Applied:

The specific criteria applied to this assessment were:

1001 Fermilab Integrated Quality Assurance (IQA) revision 2, Chapter 6 – Design

Corrective Action Plans Issued:

None

Assessors' Names (asterisk indicates team leader):

- Michael Pakan* - OQBP
- Frank Cesarano – BSS

Submitted by: Michael Pakan

Date: 9/14/12

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Distribution (Distribute to assessed organizations' management, OQBP head, and other interested parties):

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Kent Collins
Rod Walton

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Mike Pakan

Appendix 1:

Engineering Drawings Reviewed:

6-7-82 A-3	LArTF UPPER LEVEL FLOOR PLAN	Rev: -
6-7-82 A-4	LArTF ROOF PLAN	Rev: 3
6-7-82 S-3	LArTF FOUNDATION PLAN	Rev: -
10-8-1 A201-E	1ST FLOOR PLAN - EAST	Rev: 6
10-8-1 A202-E	2ND FLOOR PLAN - EAST	Rev: -
10-8-1 A20E-E	3RD FLOOR PLAN - EAST	Rev: -